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Washington, D.C. 20554

RECEIVED
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: RM-9096
Ex Parte Presentation

Dear Messrs. Iseman and Derenge:

On behalf of Minnesota Mining and Manufacturing Company (3M), we wanted to thank you for taking the time to meet with us to further discuss 3M's thoughts and concerns regarding the proposed allocation of spectrum for intelligent transportation systems as proposed in RM-9096. As described in its comments, 3M strongly supports the proposed allocation of 75 MHz for such operations. This allocation is critical to ensure adequate spectrum to facilitate the full implementation of all the Dedicated Short Range Communications (DRSC) applications, current and future. Successful deployment of DSRC applications depends on the allocation of spectrum and the properly structured use of this resource. 3M also wishes to ensure that the Commission has a good understanding of the important role that can be played by narrowband technologies in the intelligent transportation arena.

For instance, as discussed below, 3M is in the process of developing "In-Vehicle Signing" technology that would require very little spectrum, while providing significant improvements in highway safety and transportation efficiency. This technology could be used to signal drivers, through an in-vehicle display in their car, when they are approaching hazardous road conditions, such as icy bridges or dangerous curves. This same technology could alert drivers to important information such as the speed limit, the location of gas stations, and the names of streets they are approaching. Further, information not normally available from the roadside can be delivered to the vehicle, such as news of road construction or traffic backups (i.e., dynamic traffic information dissemination). In addition, the ability to receive roadside information when the visual path is obstructed by inclement weather or by other vehicles is greatly enhanced. Because of these important benefits, 3M wishes to make sure that the proposed allocation of spectrum for intelligent transportation systems is structured in a way

that will accommodate narrowband operations, in addition to the multitude of broadband services that can be operated in the 5.850-5.925 GHz band.

As demonstrated in the comments of 3M and the rulemaking petition of the Intelligent Transportation Society of America (ITS America), the proposed allocation will facilitate a number of important technologies design to improve safety and quality of life on America's roads.

The document "Spectrum Requirements for Dedicated Short Range Communications (DSRC)" prepared by ARINC for the Federal Highway Administration identifies eighteen possible DRSC applications that can be implemented under the current ITS America frequency allocation petition RM-9096 at 5.8 GHz. These Eighteen DSRC applications can be separated into two distinct types of communications links:

- one-way communications links (Roadside-to-Vehicle)
- two-way communications links (Roadside-to-Vehicle and Vehicle-to-Roadside)

Three of these applications, In-Vehicle Signing, Traffic Information Dissemination and Intersection Collision Avoidance require only a one-way communications link.

The majority of existing two-way communications links, such as Electronic Toll Collection (ETC), require very high data rates to provide viable and reliable application performance, linking Roadside-to-Vehicle and Vehicle-to-Roadside in one transaction. These high data rates translate into wide bandwidth requirements for the system, on the order of 5-10 MHz per channel depending upon the standard used. The current configurations of ETC (TC278 for example) use relatively high roadside transmitter power (2-50 watts) and low sensitivity receivers (-40 dbm minimum) for the system configuration. From the transmitter power and the receiver sensitivity it can be determined that the communication link is limited to very short range, on the order of 5-10 meters, which implies only an overhead gantry installation. The vehicle receivers are also very broadband and non-selective, to allow reception of any of the available channels; consequently there are limitations on minimum separation distances for this type of system because of interference issues.

For the types of applications that require only a one-way Roadside-to-Vehicle communication link, the data can be short static messages that will be repeated continually (for example, In-Vehicle Signing). Therefore, the required bandwidth can be greatly reduced with respect to the dynamic two-way communications links described previously. For one-way communications, a narrowband communication link will provide much greater spectral efficiencies. An outline of such a system follows. The goals of the narrowband system are to provide:

- repetitive data to the vehicle by using spectrum efficient methods
- a multiple channel reception environment without interference
- short-to-long range reception with low-power transmitters

Assumptions (Physical Layer):

Channel Bandwidth = 200 KHz
Frequency Stability (Transmitter plus Receiver) = 6 ppm
Date Rate = 32-64 KB/sec

Modulation Format = FSK
Modulation Index = .5 maximum
Frequency Deviation = 10 KHz
Modulation Type = GMSK
Spectrum Mask (out of channel) = -35 db
Minimum Receiver Sensitivity = -80 dbm
Maximum Transmitter Power = 0 dbm
Antenna Gain = dependent upon desired communication link distance

Assumptions (Data Link Layer):

Two Start Bytes
One Byte for ID and Direction
One Byte Data Type and Length
Types include warning information, road information, general information, multiple messages, roadside status, roadside location and user applications. This allows the end user to filter incoming information.
Data Byte(s)
Data will be in byte form where In-Vehicle signing messages (i.e. 'Speed Limit 55') will be determined from a lookup table in receiver

The following is a detailed outline of "Data Type" and "Data" formats and examples:

Data Type - 1 Byte - Message Type (3 bits) and Length (5 bits)
Warning 'Stop, Curve Ahead, No Passing'
Road Info 'Speed Limit 55, Junction I-95'
Consumer Info 'Gas, Food, Hotel'
User Application '"Fire Dept."Hydrant 100 ft,'
Multiple Message 'sending of more then one message'
Status 'Roadside Sign current status'
Location 'geographic location of sign'
xxx 'Future Usage'

Five bits define the length in bytes of the message or number of multiple messages.

Data Format - Length defined from above -
Most messages can be sent with a single data byte. Two Data Types are outlined below:

	Warning	Road Info
0	----------Alphanumerics----------	
.	----------Alphanumerics----------	
.	----------Alphanumerics----------	
75	----------Alphanumerics----------	
76	Stop	Speed Limit 55
77	Yield Ahead	Speed Limit 60
78	Icy Bridge	Speed Limit 65
.		
.		
256	Dangerous Curve Ahead	Rest Stop

Using this type of format allows easy translation into different languages in the vehicle display.

We hope that the above information will help to inform your decision concerning the usefulness of both two-way and one-way technologies in the intelligent transportation contexts. Both types of technologies can substantially improve everyday life for American motorists, and greatly reduce the number of fatalities and injuries due to automobile accidents.

Sincerely,

John A. Prendergast
Counsel for 3M

Edmund J. Ring
Electronic Design Specialist
3M

JAP/tda

cc: Office of the Secretary, FCC